OCCURRENCE AND BIOMETRICS OF A NEW *CAELORINCHUS* SPECIES (MACROURIDAE) FOR THE SOUTHERN ADRIATIC SEA.

Nicola UNGARO, **Alessandro VLORA**, **Chiara Alessandra MARANO**, Laboratorio Provinciale di Biologia Marina, Molo Pizzoli (Porto), Bari 70123. [biologia.marina@teseo.it], **Giovanni RIVAS** & **Alfonso MODICA**, Centro Oceanologico Mediterraneo, Via Libertà 37, Palermo 90139, ITALY.

RÉSUMÉ. - Occurrence et biométrie d'une espèce de *Caelorinchus* (Macrouridae) nouvelle pour l'Adriatique méridionale.

La zone la plus profonde de l'Adriatique méridionale a été étudiée pour la première fois, au moyen d'un chalut. Douze stations ont été échantillonnées à des profondeurs comprises entre 826 et 1196 m. Parmi les poissons capturés à plus de 1000 m, une espèce de *Caelorinchus*, très abondante et nouvelle pour l'Adriatique, a été trouvée. Les caractères méristiques et la plupart des caractères morphologiques des nombreux exemplaires capturés sont rapportés. Ils pourraient servir de base à la description de cette espèce dans le bassin meditérranéen.

Key words. - Macrouridae - *Caelorinchus* - MED - Adriatic Sea - Biometry - First record.

Knowledge of the Adriatic basin (Central Mediterranean Sea) bathyal ichthyofauna was limited until recently to upper-slope depths (to about 800 m) (Bombace and Froglia, 1973; Bello and Rizzi, 1988; Vaccarella *et al.*, 1992; Ungaro *et al.*, 1995). Information about the ichthyofauna at depths below 1000 m are scarce (e.g., Kirincic and Lepetic report (1955) on some bottom long-line catches at 800-1100 m depth). The poorness of data is probably attributable to the relatively lesser importance given to slope areas, which amount to 25% of the Adriatic bottom (Alfirevic, 1981).

Until now, four macrourid species were recorded between 160 and 800 m depths in the Adriatic basin: *Caelorinchus caelorhincus* (Risso, 1810), *Hymenocephalus italicus* Giglioli, 1884, *Nezumia sclerorhynchus* (Valenciennes, 1838) and *Trachyrincus scabrus* (Rafinesque, 1810) (Bello and Rizzi, 1988; Vaccarella *et al.*, 1992; Ungaro *et al.*, 1995). *C. caelorhincus* is the most abundant species at these depths, and some features about its biology in the basin have been reported (Ungaro *et al.*, 1994).

The occurrence and distribution of other species of *Caelorinchus* in the Mediterranean have been debated (Tortonese, 1970; Cohen *et al.*, 1990). Some authors have reported the occurrence of *C. vaillanti* Roule, 1916 (Raimbault, 1963; Relini-Orsi and Relini, 1972), *C. labiatus* (Koehler, 1896) (Stefanescu *et al.*, 1992; Massutì *et al.*, 1995) and *C. occa* (Goode & Bean, 1885) (Allué, 1983) in the western areas of the Mediterranean Sea, and the morphology of a few specimens has been described (Raimbault, 1963; Relini-Orsi and Relini, 1972; Allué, 1983).

During 1999 a trawl survey was carried out at 900-1200 m depths to investigate the demersal fauna in the deepest area of the Adriatic Sea (maximum depth 1223 m). The sampling gear collected 17 groundfish species (Ungaro *et al.*, in press), and a new species of *Caelorinchus* was one of the most abundant fishes captured. Bathymetric and length-frequency distribution, and length-weight relationships of the new species were calculated and analysed.

Materials and methods

The trawl survey was carried out in the Southern Adriatic Sea during April 1999. The main task of the survey (financed by ENI - AGIP, the Italian Petroleum Company) was to investigate the bottom fauna in order to plan offshore explorative operations. Twelve hauls, each lasting one hour, were made within the depth range 826-1196 m (Fig. 1). An otter trawl net was used (net length 35 m, horizontal opening 15-16 m, vertical opening 0.8-1.2 m, stretched-mesh size at cod-end 32 mm). Due to the operative depths, the sampling gear was towed by a single warp (the warp line was attached to a V-shaped backstrop, in turn connected to two 220 kg iron doors), and the towing speed was around 2.8 knots. The entire fish catch was frozen and brought to the laboratory; the detailed list of data collection was reported in Ungaro *et al.* (in press).

Once in the laboratory, macrourid specimens were weighed (g) and measured (mm; total length: TL; pre-anal length: PAL; head length: HL). Point-to-point measurements were taken along a parallel to the longitudinal axis of the body.

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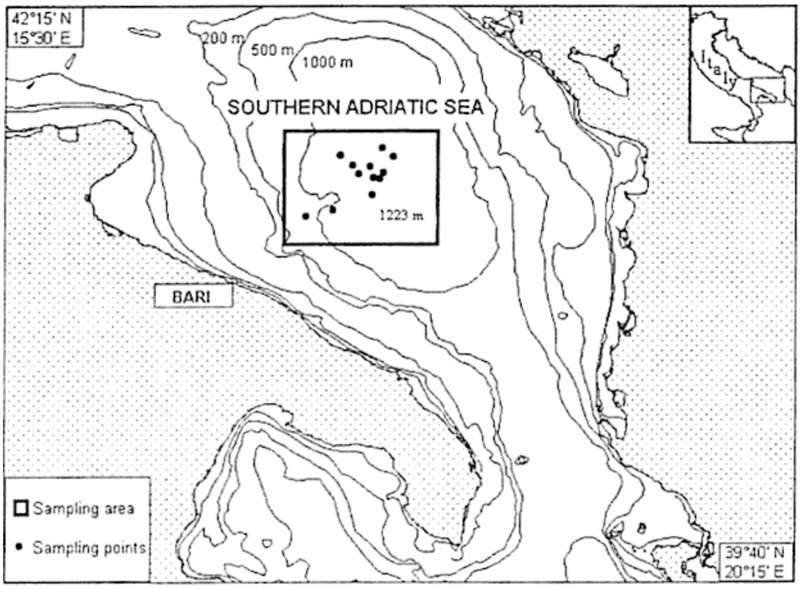

Fig. 1. – Investigated area and sampling stations.

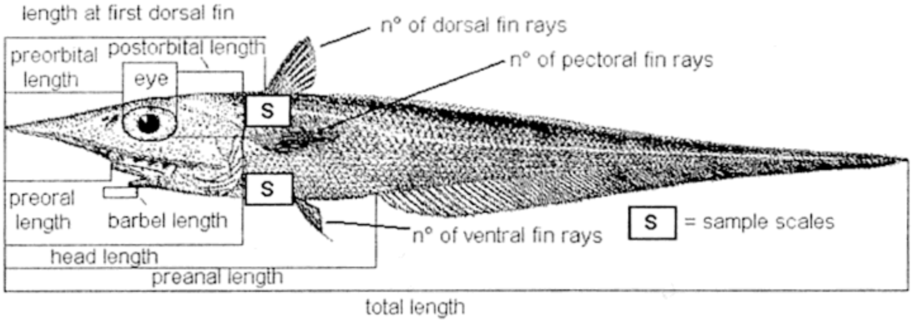

Fig. 2. – Morphometric measurements and meristic features of the sampled specimens of *Caelorinchus* sp.

Meristic features were recorded for *Caelorinchus* sp. individuals, and scales were collected from the dorsal and ventral sides (Fig. 2). Morphometric ratios were computed for undamaged specimens of *Caelorinchus* sp. Minimum, maximum, and mean ratio values were also computed, as well as the mean number of fin rays. Length-weight relationships were obtained by a non-linear function; length-frequency distributions (head length and pre-anal length) were also recorded.

Some specimens are now deposited in the collection of the Marine Biology Laboratory of Bari (code number FM5).

Results

The new grenadier species was collected in all hauls deeper than 1000 m. The abundance index (no/trawling hour) ranged from 3 to 133, while the highest values were found at depths below 1150 m ($n_o = 133$ specimens/h at 1166 m depth). The overall number of collected specimens was 280, but many of them were damaged (mainly their tail) by trawling operations and by freezing procedures. A full set of measurements was available for 24 specimens only.

Morphometric ratios and meristic features were chosen following the literature (Relini-Orsi and Relini, 1972; Allué, 1983; Whitehead *et al.*, 1986; Cohen *et al.*, 1990), and the main results (min., max. and mean values) are reported in table 1.

The shape of collected specimens (Fig. 3) and some morphometric features were close to those of *C. labiatus* or *C. occa* as described by Iwamoto (Cohen *et al.*, 1990), but the identity of the species remains doubtful (Relini-Orsi and Relini, 1972; Iwamoto, pers. comm.). The analysed scales (a total of 30 from dorsal and ventral sides) were characterised by large variability. The number of rows of spinules (and the orientation with respect to the median keel) was highly variable.

With regard to the demographic structure of the species, length-frequency distributions of the population are shown in figure 4; HL ranged from 29 to 67 mm, while PAL ranged from 38 to 100 mm.

Most specimens are included in the HL interval 46-60 mm (PAL interval 66-80 mm). Unfortunately, the determination of sex and maturity stages was difficult (probably due to freezing), but two females with developing gonads were recorded at 60-63 mm head length (210-220 mm total length).

Length-weight relationships (whole population) were computed for the variables, head length and pre-anal length (no = 158 records). The best data fitting was obtained by using power functions ($R^2 = 0.92$ and 0.93 for PAL and HL, respectively). Curves and equation parameters are shown in figure 5.

Discussion and conclusion

The occurrence of a deep *Caelorinchus* species (in addition to *C. caelorhincus*) in the Mediterranean was doubted by Tortonese (1970), but reported by Relini-Orsi and Relini (1972) for *C. vaillanti*, by Allué (1983) for *C. occa* and by Stefanescu *et al.* (1992) for *C. labiatus* in the northwestern area of the Mediterranean basin. These records probably refer to the same species, as shown by the analysis of morphometric and meristic characters (Raimbault, 1963; Relini-Orsi and Relini, 1972; Allué, 1983). Some features about the species biology were also analysed by Massutì *et al.* (1995) for populations in the northwestern Mediterranean.

In this paper we report the first finding of a second *Caelorinchus* species (other than *C. caelorhincus*) in the Adriatic Sea (Central Mediterranean).

The depth distribution of the species in the Adriatic extends below 1000 m, as was reported for *C. labiatus* in Spanish Mediterranean waters (Stefanescu *et al.*, 1992). *C. caelorhincus*, on the other hand, was found at bathyal bottoms only to 800 m (Ungaro *et al.*, 1994). Consequently, there is some evidence that the two *Caelorinchus* species are separated by well-defined depth distributions, as found by Massutì *et al.* (1995) in the northwestern Mediterranean.

Table 1 – *Caelorinchus* sp. Biometric and meristic descriptive statistics (no = 24 specimens; mean, minimum and maximum values).

Biometric and meristic features	Mean	Min.	Max.
Pre-orbital length / head length	0.46	0.41	0.49
Eye horizontal diameter / head length	0.24	0.21	0.26
Pre-orbital length / eye horizontal diameter	1.92	1.59	2.17
Total length / head length	3.63	3.33	4.12
Length at first dorsal fin / head length	1.09	1.00	1.14
Pre-anal length / head length	1.34	1.19	1.42
Pre-oral length / head length	0.42	0.36	0.47
Eye horizontal diameter / post-orbital length	0.78	0.60	0.91
Eye horizontal diameter / barbel length	3.46	2.77	4.18
First dorsal fin rays	9	9	10
Pectoral fin rays	15	13	16
Ventral fin rays	7	7	8

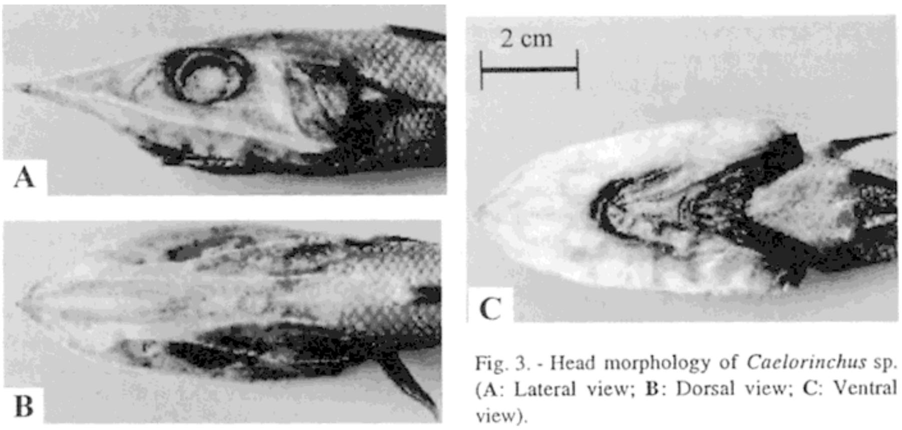

Fig. 3. - Head morphology of *Caelorinchus* sp. (**A**: Lateral view; **B**: Dorsal view; **C**: Ventral view).

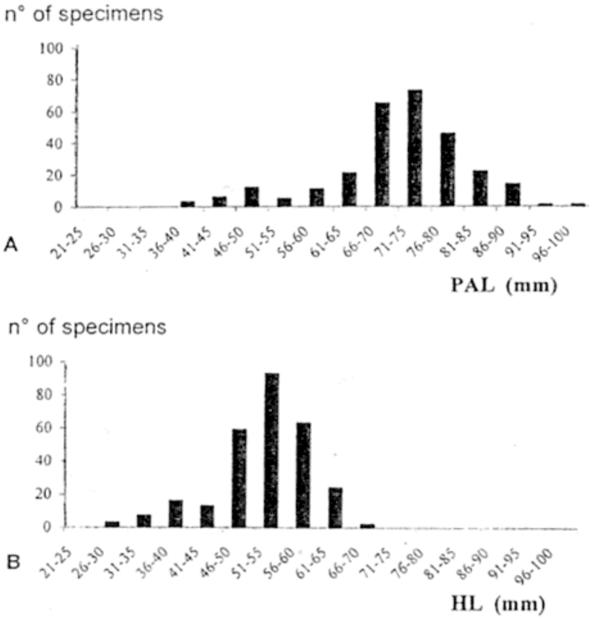

Fig. 4. - Length distributions of *Caelorinchus* sp. (n = 280 specimens) at depths below 1000 m in the southern Adriatic Sea. (**A**: Pre-anal length; **B**: Head length).

The large number of sampled specimens has provided the first comprehensive data set for some biological features, such as length distributions and length-weight relationships for the new *Caelorinchus* species in the Adriatic Sea.

Morphometric measurements and meristic features of the 24 specimens we analysed could be useful for species identification and to define the systematic position of the new species (Iwamoto, pers. comm.). Moreover, the data can be useful for developing knowledge of the distribution and biology of the species, and it awaits additional data resulting from subsequent surveys in the same and other Mediterranean areas (such as eastern basin).

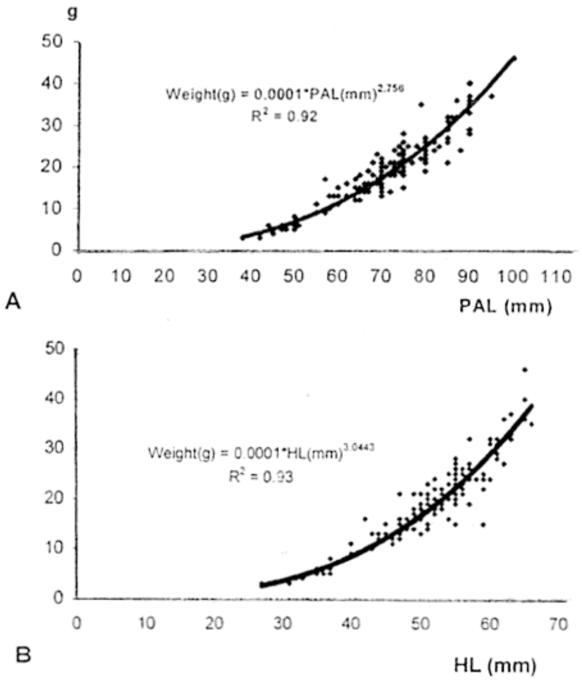

Fig. 5. Length-weight relationships of *Caelorinchus* sp. ($n_o = 158$ specimens) at depths below 1000 m in the southern Adriatic Sea. (**A**: Pre-anal length; **B**: Head length).

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